

Sub A > 1. A solid-state light source for providing light, the solid-state light source comprising:

a semiconductor light source for emitting light; and

5 a fiber optic element having an input for receiving emitted light from the semiconductor light source and an output for emitting light received from the semiconductor light source, the semiconductor light source and the fiber optic element in aggregate providing an illumination path.

40 2. The solid-state light source of claim 1 wherein the fiber optic element is in the form of a plurality of fiber optic lines, each of the plurality of fiber optic lines receiving the emitted light from the semiconductor light source.

15 3. The solid-state light source of claim 2 wherein the plurality of fiber optic lines are in the form of a bundle.

20 4. The solid-state light source of claim 1 wherein the semiconductor light source has a first surface and a second surface and is configured to emit light in opposite directions from the first surface and the second surface.

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5. The solid-state light source of claim 4 wherein the first surface of the semiconductor light source emits light to a first fiber optical line and the second surface of the semiconductor light source emits light to a second fiber optical line.

6. The solid-state light source of claim 5 wherein the semiconductor light source has a third surface and a fourth surface substantially perpendicular to the first surface, the semiconductor light source is configured to emit light in opposite directions from the third surface and the fourth surface, the third surface of the semiconductor light source configured to emit light to a third fiber optical line and the fourth surface of the semiconductor light source configured to emit light to a fourth fiber optical line.

7. The solid-state light source of claim 1, further comprising:

a plurality of semiconductor light sources.

8. The solid-state light source of claim 7 wherein the fiber optic element is an array of fiber optic lines, each

fiber optic line aligned with a corresponding one of the plurality of semiconductor light sources.

9. The solid-state light source of claim 1 wherein the semiconductor light source includes a light emitting diode (LED).

10. The solid-state light source of claim 1 wherein the semiconductor light source is configured to emit a blue light.

11. The solid-state light source of claim 1 wherein the semiconductor light source is configured to emit an ultraviolet light.

12. The solid-state light source of claim 1, further comprising a phosphor layer, the phosphor layer is located along the illumination path.

13. The solid-state light source of claim 12 wherein each semiconductor light source is in contact with a phosphor layer.

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14. The solid-state light source of claim 12 wherein a phosphor layer is located at a distal end of the fiber optic element.

5 15. The solid-state light source of claim 1, further comprising a light concentrator positioned at the semiconductor light source, the light concentrator reflects light from at least one surface of the semiconductor light source.

16. The solid-state light source of claim 1 wherein the semiconductor light source includes a first light emitting diode (LED) configured to emit blue light, a second LED configured to emit red light and a third LED configured to emit green light, an overlapping light from each LED producing white light.

17. The solid-state light source of claim 16, further comprising a mixer positioned to receive light from the first LED, the second LED, and the third LED and positioned to transmit the overlapping light to the fiber optic element.

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18. The solid state light source of claim 17 wherein in the semiconductor light source includes a fourth LED configured to emit yellow light, the mixer receives light from the fourth LED.

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19. The solid-state light source of claim 1 wherein the semiconductor light source includes a laser diode.

20. The solid-state light source of claim 1 wherein the semiconductor light source includes a vertical cavity surface emission laser.

21. The solid-state light source of claim 1 further comprising:

an encasement having an aperture positioned over the semiconductor light source;

a gel located within the encasement;

wherein the fiber optic element is inserted through the aperture and gel.

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22. The solid-state light source of claim 21 further comprising an ohmic contact positioned on a top surface of the semiconductor light source;

wherein the fiber optic bundle has a spliced-end to receive the ohmic contact.

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23. The solid-state light source of claim 1, further
5 comprising a lens for receiving light from the semiconductor source.

24. The solid-state light source of claim 23 wherein the semiconductor light source is optically aligned with the lens and the lens is optically aligned with the fiber optic element.

25. The solid-state light source of claim 24 wherein the semiconductor light source is positioned in a first optical conjugate plane from the lens and the fiber optic element is positioned in a second optical conjugate plane from the lens.

26. The solid-state light source of claim 1, further comprising an array of lenses.

27. The solid-state light source of claim 24, further comprising an array of fiber optic lines corresponding to each of the lenses.

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28. The solid-state light source of claim 27 wherein the solid-state light source further comprises an array of semiconductor light sources corresponding to each of the lenses.

29. The solid-state light source of claim 1, further comprising:

an array of lenses configured to collimate light from a corresponding array of semiconductor light sources; and
a focusing lens configured to focus a collimated light from the array of lenses.

30. The solid-state light source of claim 29 wherein the focusing lens focuses the collimate light onto a light guide.

31. The solid-state light source of claim 1 wherein the output of the fiber optic element is configured to be received by an endoscope.

32. A solid-state light source for providing light to an endoscope, the solid-state light source comprising:
a semiconductor light source for emitting light; and

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an optical system having an optical element, the optical system having an input for receiving emitted light from the semiconductor light source, the optical system having an output for receiving light from the optical element, the output configured to be received by the endoscope, the optical system and the semiconductor light source in aggregate providing an illumination path.

33. The solid-state light source of claim 32 wherein the optical element includes an optical fiber.

34. The solid-state light source of claim 32 wherein the semiconductor light source emits light to an optical fiber.

35. The solid-state light source of claim 32 wherein the optical fiber extends from the semiconductor light source to an interface of a light guide, the light guide extending to the output.

36. The solid-state light source of claim 32 wherein the semiconductor light source includes a light emitting diode (LED).

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37. The solid-state light source of claim 32 wherein each semiconductor light source is configured to emit a blue light.

5 38. The solid-state light source of claim 32 wherein each semiconductor light source is configured to emit an ultraviolet light.

39. The solid-state light source of claim 32, further comprising a phosphor layer, the phosphor layer is located along the illumination path.

7. 40. The solid-state light source of claim 39 wherein each semiconductor light source is in contact with a phosphor layer.

41. The solid-state light source of claim 39 wherein a phosphor layer is located at a distal end of the endoscope.

20 42. The solid-state light source of claim 32, further comprising a light concentrator positioned at the semiconductor light source, the light concentrator reflects

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light from at least one surface of the semiconductor light source.

43. The solid-state light source of claim 32 wherein the semiconductor light source includes a first light emitting diode (LED) configured to emit blue light, a second LED configured to emit red light and a third LED configured to emit green light, an overlapping light from each LED producing white light.

44. The solid-state light source of claim 43, further comprising a mixer positioned to receive light from the first LED, the second LED and the third LED and positioned to transmit the overlapping light to the fiber optic line.

45. The solid state light source of claim 44 wherein in the semiconductor light source includes a fourth LED configured to emit yellow light, the mixer receives light from the fourth LED.

46. The solid-state light source of claim 32 wherein the semiconductor light source includes a laser diode.

47. The solid-state light source of claim 32 wherein the semiconductor light source includes a vertical cavity surface emission laser.

48. The solid-state light source of claim 32 wherein the semiconductor light source has a first surface and a second surface and is configured to emit light in opposite directions from the first surface and the second surface.

49. The solid-state light source of claim 48 wherein the first surface emits light to a first fiber optic line and the second surface emits light to a second fiber optic line.

50. The solid-state light source of claim 49 wherein the semiconductor light source has a third surface and a fourth surface substantially perpendicular to the first surface, the semiconductor light source is configured to emit light in opposite directions from the third surface and the fourth surface, the third surface of the semiconductor light source configured to emit light to a third fiber optical line and the fourth surface of the semiconductor light source configured to emit light to a fourth fiber optical line.

51. The solid-state light source of claim 32 further comprising:

an encasement having an aperture positioned over the semiconductor light source;

a gel located within the encasement;

wherein the fiber optic element is inserted through the aperture and gel.

52. The solid-state light source of claim 51 further comprising an ohmic contact positioned on a top surface of the semiconductor light source;

wherein the fiber optic bundle has a spliced-end to receive the ohmic contact.

53. The solid-state light source of claim 32 wherein the optical system includes an array of lenses and a corresponding array of fiber optic lines.

54. The solid-state light source of claim 53 wherein an array of semiconductor light source is optically aligned with a corresponding lens and each corresponding lens is optically aligned with a corresponding fiber optic line.

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55. The solid-state light source of claim 54 wherein each semiconductor light source is positioned in a first optical conjugate plane from the corresponding lens and each corresponding fiber optic line is positioned in a second optical conjugate plane from the corresponding lens.

56. The solid-state light source of claim 32 wherein the optical element includes:

an array of lenses configured to collimate light from a corresponding array of semiconductor light sources; and
a focusing lens configured to focus a collimated light from the array of lenses.

57. The solid-state light source of claim 56 wherein the focusing lens focuses the collimated light onto a light guide.

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